Research Product 81-25c

A LEARNING-BASED MODEL FOR MEDIA SELECTION:

MEDIA SELECTION FLOWCHART AND USER'S GUIDE

SIMULATION SYSTEMS TECHNICAL AREA

March 1981

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U.S. ARMY RESEARCH INSTITUTE for the BEHAVIORAL and SOCIAL SCIENCES

U. S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES

A Field Operating Agency under the Jurisdiction of the Deputy Chief of Staff for Personnel

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Florida State University

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report describes a new media selection model developed as part of a project aimed at improving procedures available for media selection in connection with U.S. Army training. The model addresses factors of learning effectiveness by means of a flowchart which permits successive exclusion of media from an initial candidate set. Derivation of the model focused particularly upon principles of human learning which affect decisions about media, in particular the nature of instruction.

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Item 20 (Cont'd)

The proposed model is described with consideration of some of the apparent limitations of guidelines for media selection in the Instructional Systems Development (ISD) model. Difficulties experienced in the use of these guidelines provided a part of the reason for developing the new model. A description is given of the method of use of the new model and its incorporation into the ISD procedure. Benefits that may be derived from use of the model are also indicated.

A Learning-Based Model For Media Selection

Media Selection Flowchart

What You Will Need

As you proceed through the media selection flowchart, some of the decisions you will make will be based upon earlier decisions in the instructional development process. You may want to gather information about these earlier decisions before you begin using the flowchart. If the ISD approach (TRADOC Pam 350–30) has been followed, all of the necessary information will be available from previous documentation. Some of this information may be apparent to you and will not have to be looked up. The information you will need is listed below:

1. The course objectives, i.e., the terminal learning objectives (TLOs) and learning objectives (LOs) (from ISD Block II.1).

2. The classification of each objective into a category of learning (from ISD Blocks II.1 and III.1).

3. The instructional setting (from ISD Block I.5 and/or administrative decisions).

4. Whether or not the students can be considered readers (from ISD Block II.3).

5. The learning guidelines and activities (from ISD Block III.1).

6. Information on the "consequences of inadequate performance" (from ISD Block I.2).

7. The job performance measures (JPMs) that relate to each TLO (from ISD Block I.3).

8. Constraints in the instructional situation (from ISD Block I.3).

How to Proceed

1. Review all the terminal learning objectives (TLOs) and learning objectives (LOs) for the lesson or course you are considering.

2. List each objective on the Media Selection Worksheet. A copy of the worksheet can be found in the last section of the User's Guide, on page 38.

3. Proceed through the media selection flowchart with each TLO and LO individually.

4. Begin at chart A by entering the diagram at the left and proceeding in the general directions right and down.

5. Diamonds with numbers  contain questions indicating that a decision is to be made.

6. Rectangular boxes  indicate actions to be taken on the basis of previous decisions.

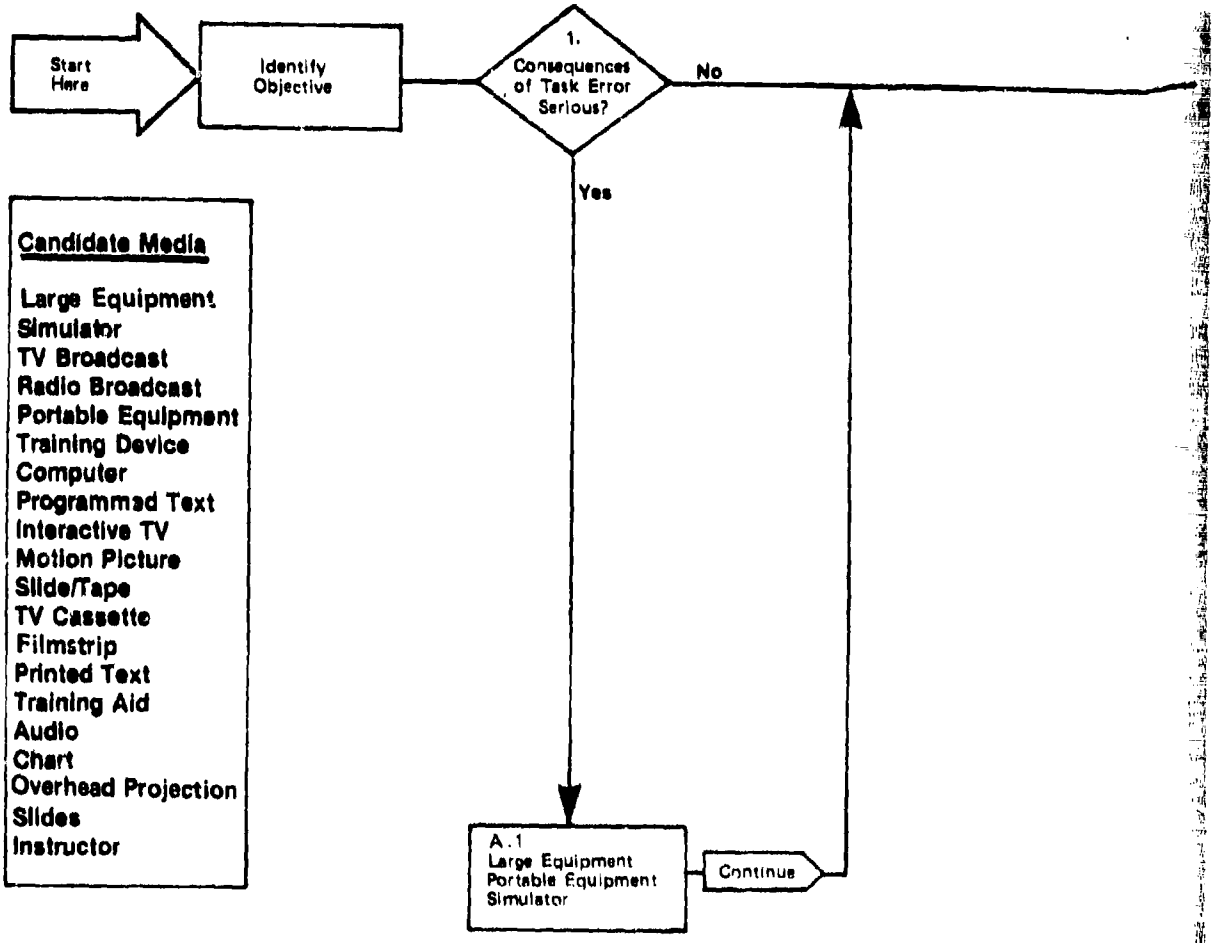
7. When you reach a box on the bottom line of the flowchart, turn to the Media Selection Worksheet and place a check mark by each of the media in the bottom line box selected.

8. After you have used the flowchart to identify the appropriate media for each objective in the lesson or course, make your final selection decision using the procedures listed on the back of the flowchart.

IMPORTANT

- A detailed description of each question on the flowchart appears in the list at the bottom of each page.
- If you need additional assistance, refer to the User's Guide. It contains criteria for each of the flowchart questions, definitions of each medium, and a complete discussion of the final selection procedure.
- Before proceeding, read the section of the User's Guide entitled "Example of How to Use the Flowchart."

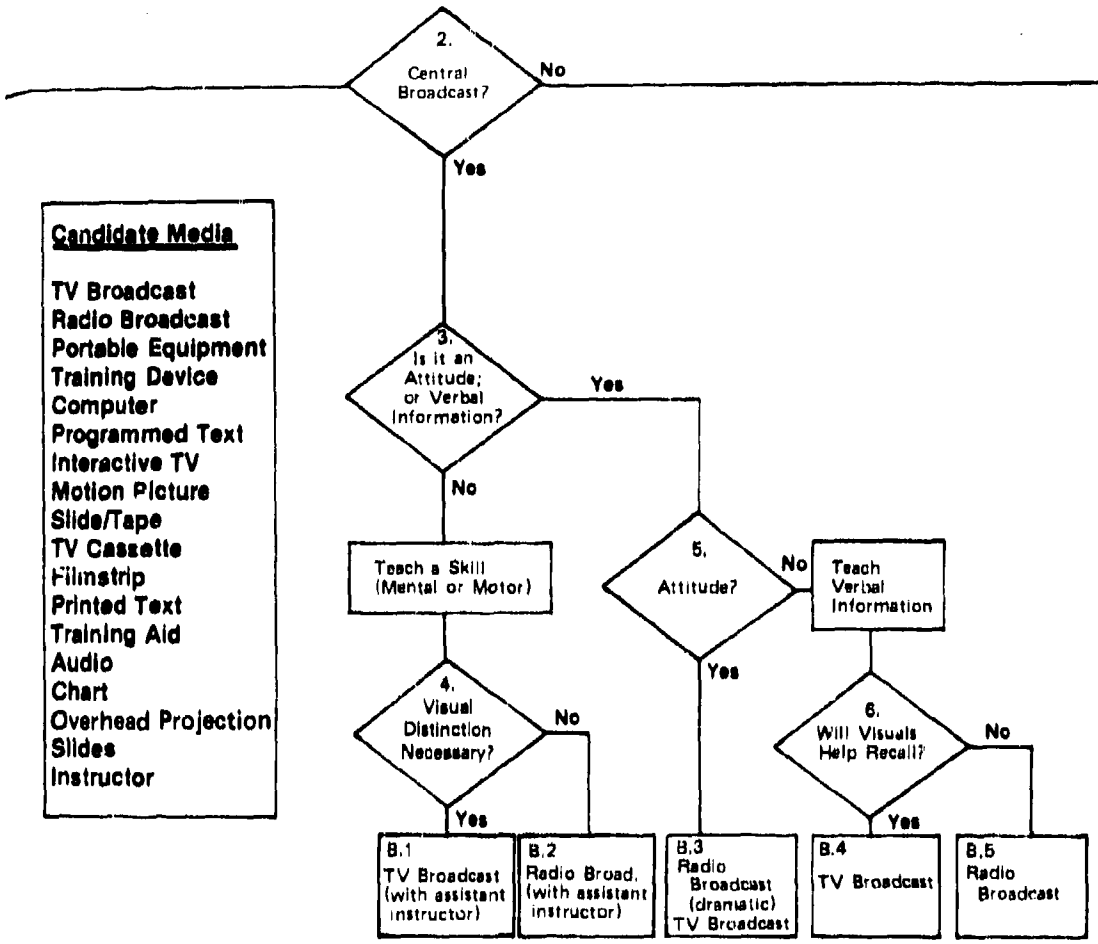
Chart A. Job Competence Decision



Explanation of Questions - Chart A

1. Consequence of Task Error Serious? When the graduate is first required to perform the task on the job, are the consequences of error serious?

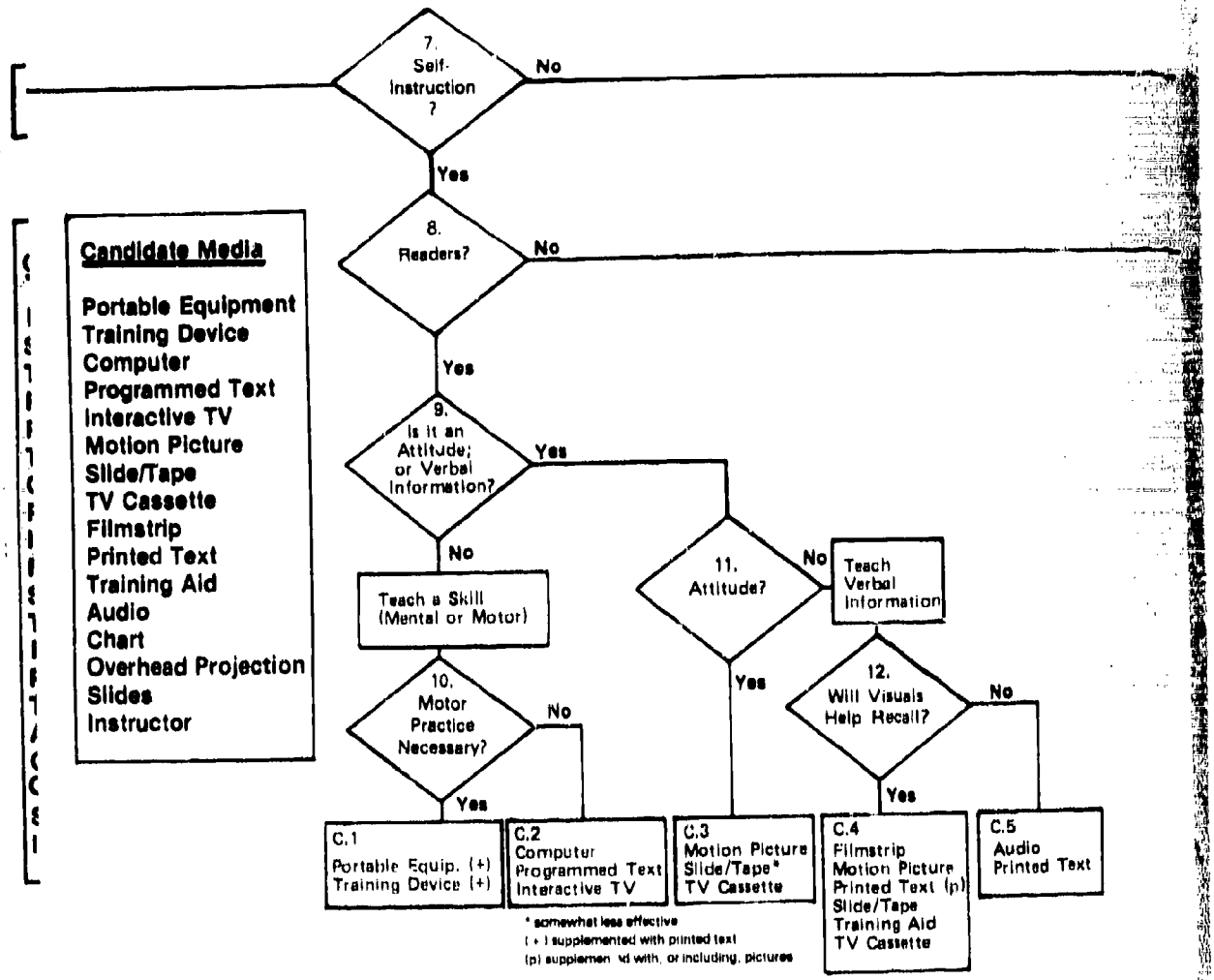
Chart B. Central Broadcast Decision



Explanation of Questions - Chart B

2. Central Broadcast? Is the training system designed to serve students who are dispersed over a wide geographic area and who are able to receive centrally broadcast instruction at schedule times?
3. Is it an Attitude; or Verbal Information? Is the aim to influence the trainee's values (attitudes); or to a have the trainee learn to 'state' (rather than 'do') something?
4. Are Visual Distinctions Necessary? Is the visual presentation of task features necessary or will it aid in learning the task?
5. Attitude? Does training aim to influence the trainee's values or opinions?
6. Will Visuals Help Recall? Is it likely that the use of visuals will help the learner establish images that will aid recall of verbal information?

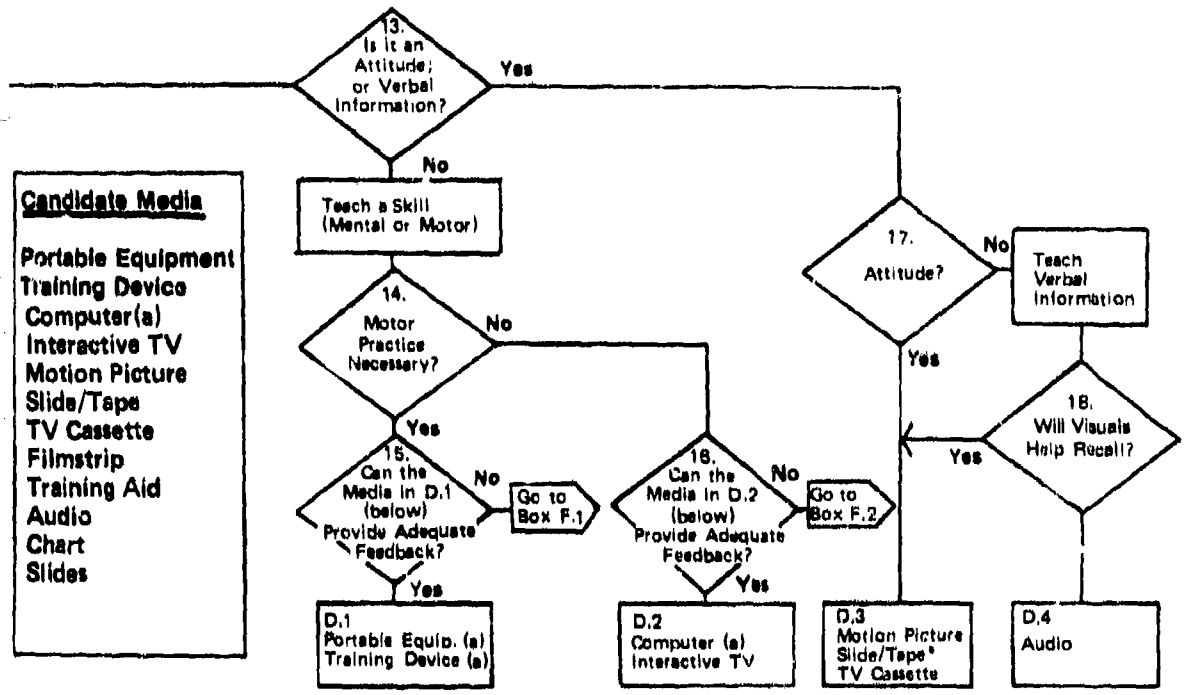
Chart C. Self-Instruction with Readers



Explanation of Questions - Chart C

7. Self-Instruction? Are trainees expected to learn by self-instruction, without an instructor?
8. Readers? Are the trainees capable of gaining information from printed Army Training materials?
9. Is it an Attitude; or Verbal Information? Is the aim to influence the trainee's values (attitudes); or to have the trainee learn to 'state' (rather than 'do') something?
10. Motor Practice Necessary? Does the skill to be learned require smooth timing of muscular movements (a "motor skill")?
11. Attitude? Does training aim to influence the trainee's values or opinions?
12. Will Visuals Help Recall? Is it likely that the use of visuals will help the learner establish images that will aid recall of verbal information?

Chart D. Self-Instruction with Non-Readers

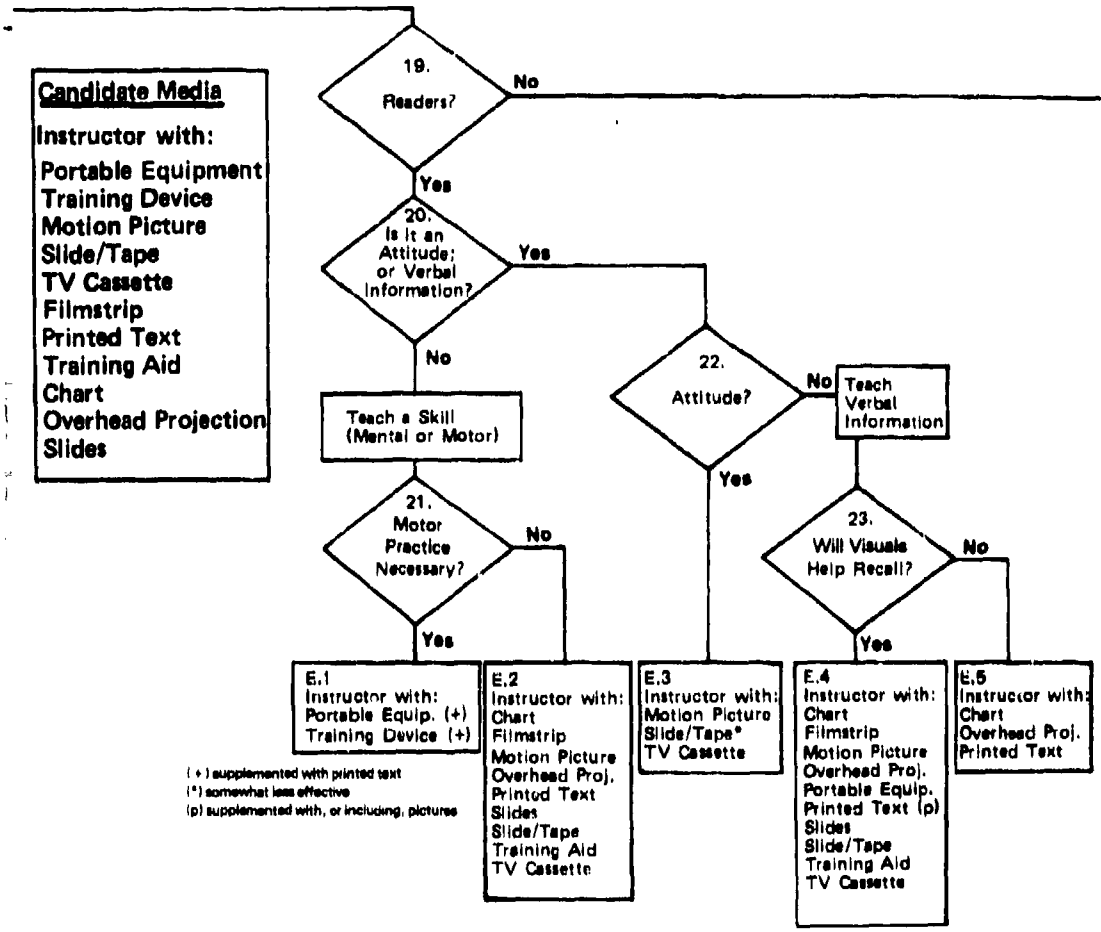


(a) supplemented with, or including, audio speech
* somewhat less effective

Explanation of Questions - Chart D

13. Is it an Attitude; or Verbal Information? Is the aim to influence the trainee's values (attitudes); or to have the trainee learn to 'state' (rather than 'do') something?
14. Motor Practice Necessary? Does the skill to be learned require smooth timing of muscular movements (a "motor skill")?
15. Can the Media in D.1 Provide Adequate Feedback? Can the Media in D.1 accept and evaluate the desired student responses and provide the type of feedback planned?
16. Can the Media in D.2 Provide Adequate Feedback? Can the Media in D.2 accept and evaluate the desired student responses and provide the type of feedback required?
17. Attitude? Does training aim to influence the trainee's values or opinions?
18. Will Visuals Help Recall? Is it likely that the use of visuals will help the learner establish images that will aid recall of verbal information?

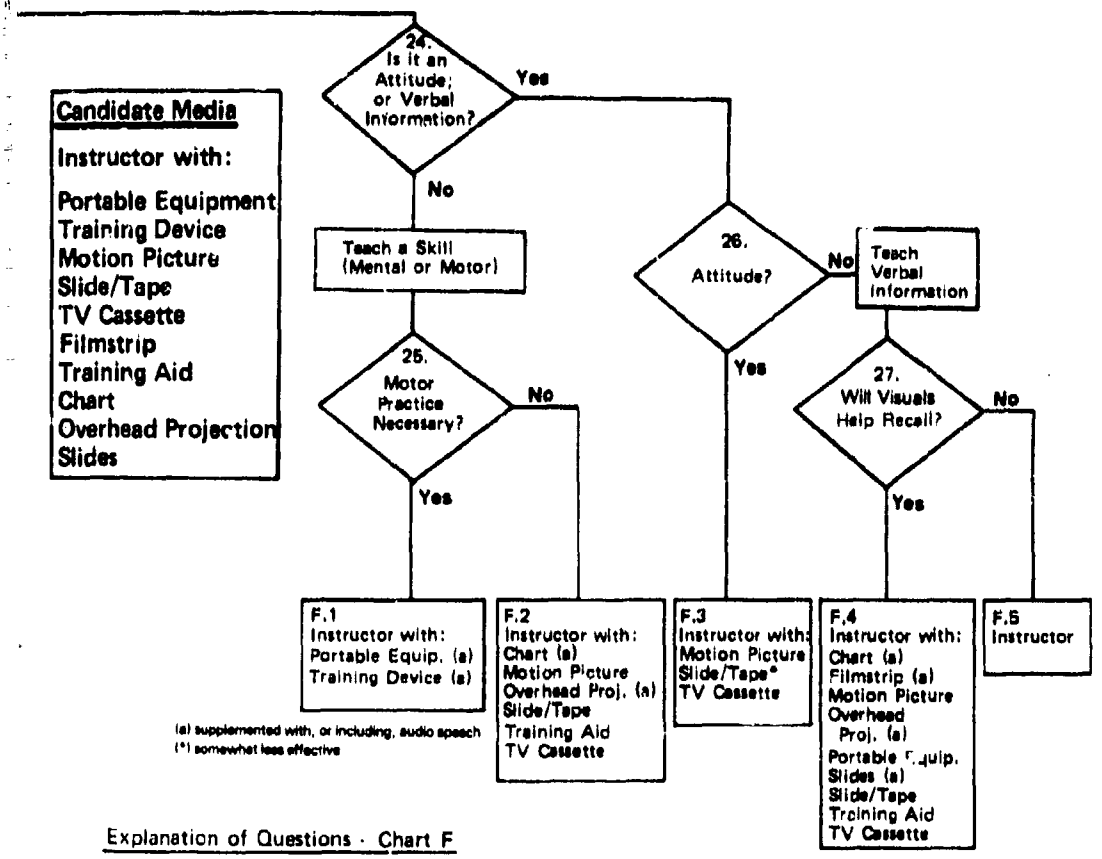
Chart E. Instructor with Readers



Explanation of Questions - Chart E

19. Readers? Are the trainees capable of gaining information from printed Army Training materials?
20. Is it an Attitude; or Verbal Information? Is the aim to if influence the trainee's values (attitudes); or to have the trainee learn to 'state' (rather than 'do') something?
21. Motor Practice Necessary? Does the skill to be learned require smooth timing of muscular movements (a "motor skill")?
22. Attitude? Does training aim to influence the trainee's values or opinions?
23. Will Visuals Help Recall? Is it likely that the use of visuals will help the learner establish images that will aid recall of verbal information?

Chart F. Instructor with Non-Readers



Explanation of Questions - Chart F

24. Is it an Attitude; or Verbal Information? Is the aim to influence the trainee's values (attitudes); or to have the trainee learn to 'state' (rather than 'do') something?
25. Motor Practice Necessary? Does the skill to be learned require smooth timing of muscular movements (a "motor skill")?
26. Attitude? Does training aim to influence the trainee's values or opinions?
27. Will Visuals Help Recall? Is it likely that the use of visuals will help the learner establish images that will aid recall of verbal information?

Final Selection Procedure

Making A Final Selection

After you have used the flowchart to identify the appropriate media for each objective in the lesson or course, and have filled in the Media Selection Worksheet, make a final selection using the procedure below. Either a single medium or a combination of media may be chosen when making a final selection decision. (Note: media definitions are found on page 32 of the User's Guide).

1. Eliminate media by crossing off media which are not feasible in the situation for which training is being designed. The following questions are relevant:
   - Can the medium be produced by the time needed?
   - Can the costs of production, maintenance, and operation be afforded?
   - Can the medium be approved as compatible with existing policies and programs?
   - Is the medium practical for use in its intended environment?

2. Make a final choice of media. Consider the following questions:
   - Is more than one medium necessary to enable students to acquire each of the objectives?
   - What are the comparative costs of the final candidate media and media combinations?
   - Can each medium meet your estimated requirements for change and updating?

   Circle your final selection choices on the Media Selection Worksheet.

Research Product 81-25c

A LEARNING-BASED MODEL FOR MEDIA SELECTION:

MEDIA SELECTION FLOWCHART AND USER'S GUIDE

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2Q263744A795

Training and Education
Training Simulation

FOREWORD

The research leading to the development of these Research Products was begun under RDTE Project Number 2Q762772A764, ARI FY 78 and 79 Work Program (Training and Education). The results of these efforts were fed into subsequent research conducted under RDTE Project Number 2Q263744A795, ARI FY 80 Work Program (Training Simulation). The final research was conducted by the Learning Systems Institute of Florida State University under contract number MDA 903-80-C-0218.

The research had as its major objectives to assess current models and the state of the art in selection of alternative instructional delivery systems, to determine the type and extent of problems encountered in applying existing models, and to recommend changes and improvements.

The research is directly responsive to the expressed needs of the Army Training Support Center (ATSC) of the Training and Doctrine Command (TRADOC).

Research Product 81-25A describes the theoretical background of the research in selection of Instructional Media.

Product 81-25C presents the Model itself, its attendant flowchart, and Users Guide.

Mr. T.J. Houston of the Simulation Systems Technical Area served as COR for this research.

JOSEPH ZEIDNER
Technical Director

A LEARNING-BASED MODEL FOR MEDIA SELECTION:
MEDIA SELECTION FLOWCHART AND USER'S GUIDE

EXECUTIVE SUMMARY

Requirement:

This report describes a project that was conducted in order to collect information about instructional media selection procedures and problems in the U.S. Army and to recommend means of improving the media selection process.

Procedure:

In order to identify procedures and problems, four Army schools were visited and 29 instructional developers who made media selection decisions were interviewed. After procedures and problems were identified, a new media selection model was developed. The model was revised several times. The first revision was based upon feedback from 12 instructional designers (eight faculty and four graduate students) at Florida State University who were asked to review the model. Subsequent revisions were based upon formative evaluation data collected from six graduate students in instructional design, six instructional developers at Fort Gordon, and five instructional developers at Fort Rucker.

Findings:

A systematic means of selecting media is rarely used. An existing media selection model that is perceived as too complex often leads to the selection of media based on convenience and the developer's intuition and experience. However, the majority of Army instructional developers who reviewed the new media selection model indicated that there was a high probability that it would be used on the job.

Utilization of Findings:

Whether instructional developers in the Army use the model depends largely upon whether the model is properly disseminated. If the model is disseminated properly, it could have a very positive effect upon the media selection procedure used in the Army.

TABLE OF CONTENTS

Introduction

The Media Selection Flowchart provides a system to assist developers of Army training in accomplishing the following two actions:

(1) identifying those media which can best aid the training process; and,

(2) eliminating from further consideration those media which cannot.

Contemporary theories of human learning, and the scientific evidence relating to these theories, provide the basis for the media selection principles incorporated in the Media Selection Flowchart. The flowchart draws upon this evidence and theory so as to identify the most appropriate media for a given objective.

Once appropriateness has been determined by using the flowchart, the choice of a medium or media becomes a matter of convenience, ready availability, cost, and other factors affecting practicality. The other sections of this User's Guide provide information that will help you use the flowchart.

General Directions

What You Will Need

As you proceed through the Media Selection Flowchart, some of the decisions you will make will be based upon earlier decisions in the instructional development process. You may want to gather information about these decisions before you begin using the flowchart. If the ISD approach (Pam 350-30) has been followed, all of the necessary information will be available from previous documentation. The information you will need is listed below:

1. The course objectives, i.e., the terminal learning objectives (TLOs) and learning objectives (LOs) (from ISD Block II.1);
2. The classification of each objective into a category of learning (from ISD Blocks II.1 and III.1);
3. The instructional setting (from ISD Block 1.5 and/or administrative decisions);
4. Whether or not the students can be considered readers (from ISD Block II.3.);
5. The learning guidelines and activities (from ISD Block III.1);
6. Information on the "consequences of inadequate performance" (from ISD Block I.2);
7. The job performance measures (JPMs) that relate to each TLO (from ISD Block I.3);
8. Constraints in the instructional situation (from ISD Block I.3.).

How to Proceed

After the necessary information has been gathered, review all the terminal learning objectives (TLOs) and learning objectives (LOs) for the lesson or course you are considering. List each objective on the Media Selection Worksheet. A copy of the worksheet can be found in the last section of this User's Guide, on page 38.

Proceed through the Media Selection Flowchart with each TLO and LO individually. Begin at Chart A and, unless an arrow indicates otherwise, proceed to the right and down. When you reach a box on the bottom-line of the flowchart, turn to the Media Selection Worksheet and place a check mark by each of the media in the botton-line box selected. You will use the worksheet during the final selection procedure.

After you have used the flowchart to identify the appropriate media for each objective in the lesson or course, make your final selection decision using the procedures listed on the back of the flowchart.

Example of How to Use the Media Selection Flowchart

This section of the User's Guide is designed to provide an example of how to use the Media Selection Flowchart. The objective that we will use in this example is shown below.

Objective:	Load an M16A1 rifle magazine so that it will feed properly into an M16A1 rifle.
Note:	This objective is a motor skill that is to be taught by an instructor to trainees who cannot read.

We will now describe how to use the flowchart to identify appropriate media for teaching this objective. Refer to the flowchart as you read this section.

(a) Turn to page 3 of the flowchart, "Chart A. Job Competence Decision."

(b) In the top left-hand corner of the chart, find the arrow which says, "Start Here."

(c) The arrow points to a rectangular box that says, "Identify Objective." The objective we will be using in this example is "Load an M16A1 rifle...." You should list the objective in one of the spaces provided across the top of the Media Selection Worksheet. A blank copy of the worksheet, which you can duplicate, is included in the last section of this User's Guide, on page 38.

(d) Now that you have identified the objective, follow the line on the flowchart to the next box, Question #1.

Question #1: "Consequences of task error serious?"

Explanation: If you do not understand the meaning of this question, you will find it explained at the bottom of Chart A of the flowchart. Notice that the explanation number corresponds to the question number. If you wanted even more detailed information, you could find it on page 16 of this User's Guide, in the section entitled "Explanation of Flowchart Questions." The tabs in that section refer to the question numbers on the flowchart.

Answer: The mishandling of a rifle could have serious consequences; therefore, the answer to Question #1 is "Yes."

(e) Follow the "yes" line from Question #1 to box A.1 at the bottom of Chart A. Whenever you reach one of the boxes at the bottom of any of the charts of the flowchart, you should check the media contained in that box in the appropriate column on your Media Selection Worksheet. In this case, in the column you labeled "Load an M16A1 rifle," you would check large equipment, portable equipment, and simulator because those are the media contained in box A.1 on the flowchart. A filled-in example of the Media Selection Worksheet can be found on page 6 of this User's Guide. Note that the media listed on the worksheet are in alphabetical order.

MEDIA SELECTION WORKSHEET

1. List TLOs and LOs
2. Check appropriate media for each (from bottom line boxes in flowchart).
3. Make final choice of media using criteria on last page of flowchart.
4. Circle your final selection choices.

OBJECTIVES

Load a M16A Rifle

Audio	
Chart	
Computer	
Filmstrip	
Instructor	
Interactive TV	✓
Large Equipment	
Motion Picture	
Overhead Projector	✓
Portable Equipment	
Printed Text	
Programmed Text	
Radio Broadcast	✓
Simulator	
Slides	
Slide/Tape	
Training Aid	
Training Device	
TV Broadcast	
TV Cassette	

(f) Return to Chart A, page 3 of the flowchart. From box A.1 at the bottom of the chart, you will see a line that has you continue back to the top of the chart and the mainstream of the flowchart. This indicates that not only are the media found in box A.1 potentially useful, but that there are still other media selection decisions that have to be made.

(g) Follow the line across the top of Chart A and into "Chart B. Central Broadcast Decision."

Your next decision point is Question #2.

Question #2.: "Central Broadcast?"

Explanation: If you do not understand the meaning of this question, you will find it explained at the bottom of Chart B. More detailed information about the question is contained on page 18 of this User's Guide, in the section labelled "Explanation of Flowchart Questions." Both references state that, in order to justify central broadcast, students must be dispersed over a wide geographic area and they must be able to receive centrally broadcast instruction at scheduled times.

Answer: Neither the objective nor the accompanying information mention anything about students being spread over a wide geographic area; therefore, the answer to question #2 is "No."

(h) Follow the "no" line across the top of Chart B and continue to "Chart C. Self-Instruction with Readers."

Your next decision point is Question #7.

Question #7: "Self-Instruction?"

Explanation: The explanation of Question #7 at the bottom of Chart C indicates that self-instruction means that trainees are expected to learn without the help of an instructor. A more detailed explanation is contained on page 24 of this User's Guide, in the section labelled "Explanation of Flowchart Questions."

Answer: Since the information provided with the objective specifically states that the trainees are to be taught by an instructor, the answer to question #7 is "No."

(i) Follow the "no" line across the top of Chart C, continue across the top of "Chart D. Self-Instruction with Non-Readers," and enter "Chart E. Instructor with Readers" where you will find your next decision point.

Question #19: "Readers?"

Explanation: While it is likely that the meaning of this question is clear, a further explanation is contained at the bottom of Chart E and on page 26 of the User's Guide.

Answer: The information provided with the objective states that the trainees cannot read; therefore, the answer is "No."

(j) Follow the "no" line across the top of Chart E and into "Chart F. Instruction with Non-Readers."

Your next decision point is Question #24.

Question #24: "Is it an Attitude; or Verbal Information?"

Explanation: This question requires you to identify whether the type of learning specified in the objective is an attitude or verbal information, as opposed to a motor skill or a mental skill. The question is explained in greater detail at the bottom of Chart F and on page 19 of this User's Guide. It is particularly important to note the distinction between verbal information objectives and mental skills objectives. Verbal information objectives require the trainee to state something (state some information), whereas mental skills objectives require the trainee to do something (use some information).

Answer: The nature of the objective strongly suggests that a motor skill is involved and the information provided with the objective confirms that fact. Therefore, the answer is "No."

(k) Follow the "no" line down Chart F. You will notice that the next box confirms that you are teaching either a mental or motor skill. Proceed to the next decision point, Question #25.

Question #25: "Motor Practice Necessary?"

Explanation: The explanation of Question #25 at the bottom of Chart F indicates that motor practice is required when the skill to be learned requires "smooth timing of muscular movements (a 'motor skill')." Page 27 of the User's Guide contains a more detailed explanation.

Answer: Since the objective is a motor skill that requires smooth timing, the answer is "Yes."

(l) Follow the "yes" line down to box F.1 at the bottom of Chart F. Just as you did when you reached box A.1 on Chart A, you should record the media listed in box F.1 on your Media Selection Worksheet. A filled-in example of the worksheet can be found on page 11 of this User's Guide.

In marking the appropriate boxes on the worksheet, instead of using a check mark as you may have done with the media listed in box A.1, you would use an "(a)" for portable equipment and an "(a)" for training device. The reason for this is that in box F.1, there is an (a) beside both media. By looking at the footnote to box F.1, you will see that the (a) means that these media should be supplemented with audio. You will be reminded of that fact by placing an (a) in the appropriate places on the worksheet.

When marking the media on the Media Selection Worksheet, use special marks such as (a) or (*), if appropriate, to remind you of the qualifications that accompany the media.

MEDIA SELECTION WORKSHEET

1. List TLOs and LOs
2. Check appropriate media for each (from bottom line boxes in flowchart).
3. Make final choice of media using criteria on last page of flowchart.
4. Circle your final selection choices.

	OBJECTIVES: Load a M16A1 Rifle
Audio	
Chart	
Computer	
Filmstrip	
Instructor	✓
Interactive TV	
Large Equipment	✓
Motion Picture	
Overhead Projector	
Portable Equipment	✓ (2)
Printed Text	
Programmed Text	
Radio Broadcast	
Simulator	✓
Slides	
Slide/Tape	
Training Aid	
Training Device	(2)
TV Broadcast	
TV Cassette	

(m) Since there are no lines leading from box F.1, you have finished using the MSF for the sample objective. Now, assuming that you are not teaching any other objectives as part of the same lesson, you must decide which of the media you have checked on the Media Selection Worksheet will be used in teaching the objective.

(n) Turn to page 9 of the flowchart. That page describes how to make a final decision. Read the first paragraph on that page.

(o) As suggested by the first paragraph on page 9 of the flowchart, when making a final selection decision, one medium or a combination of media may be chosen. Therefore, it would be wise to know the similarities and differences between media that you have checked on the worksheet. You could find that information starting on page 32 of this User's Guide, in the section entitled "Media Definitions." The media defined in that section are listed in alphabetical order.

(p) Turn, again, to page 9 of the flowchart. Read section 1 to see of any media could be easily eliminated.

(q) It might be decided that the use of large equipment or a simulator to teach the operation of loading a rifle is not feasible, both in terms of cost and practicality. Therefore large equipment and simulator should be crossed off your worksheet.

(r) Now read section 2 on page 9 of the flowchart to see what criteria should be considered in making a final selection decision.

(s) In looking at comparative costs, it would probably be more costly and no more effective to develop a training device for teaching the use of a rifle than using the rifle itself. Therefore, training device should be crossed off your worksheet.

(t) The only remaining media checked on the worksheet are an instructor and portable equipment (i.e., a rifle). These two media are the ones you would use to teach the objective. Circle them on your Media Selection Worksheet. Page 14 of this User's Guide contains a filled-in example of how the worksheet would look after the final choice of media has been made.

NOTE: Often you will need to select media for a group of objectives that are to be taught in one lesson. In that case, you would:

(1) use the flowchart to identify the appropriate media for each objective

(2) list each objective and its appropriate media on the Media Selection Worksheet, and

(3) use the procedure described on page 9 of the flowchart to make your final media selection decision.

An example of a worksheet used to list the appropriate media for several objectives that will be taught in the same lesson is shown on page 15 of this User's Guide. Note that the final selection procedure is not used until the appropriate media for each objective have been identified.

MEDIA SELECTION WORKSHEET

1. List TLOs and LOs
2. Check appropriate media for each (from bottom line boxes in flowchart).
3. Make final choice of media using criteria on last page of flowchart.
4. Circle your final selection choices.

OBJECTIVES

load a M16A1 Rifle

Audio														
Chart														
Computer														
Filmstrip														
Instructor	✓													
Interactive TV														
~~Large Equipment~~	✓													
Motion Picture														
Overhead Projector														
Portable Equipment	✓ (2)													
Printed Text														
Programmed Text														
Radio Broadcast														
~~Simulator~~	✓													
Slides														
Slide/Tape														
Training Aid														
~~Training Device~~	(2)													
TV Broadcast														
TV Cassette														

MEDIA SELECTION WORKSHEET

1. List TLOs and LOs
2. Check appropriate media for each (from bottom line boxes in flowchart).
3. Make final choice of media using criteria on last page of flowchart.
4. Circle your final selection choices.

	OBJECTIVES	Objective 1, Lesson 7.3	Objective 2, Lesson 7.3	Objective 3, Lesson 7.3										
Audio														
Chart		✓												
Computer		✓												
Filmstrip	✓													
Instructor			✓											
Interactive TV		✓												
Large Equipment		✓		✓										
Motion Picture	✓		✓											
Overhead Projector			✓											
Portable Equipment		✓												
Printed Text	(✓)													
Programmed Text		✓												
Radio Broadcast			✓											
Simulator		✓												
Slides			✓											
Slide/Tape	✓		✱											
Training Aid	✓													
Training Device														
TV Broadcast														
TV Cassette	✓		✓											

Consequences of Task Error Serious?

(Decision 1)

Are there serious consequences of error in the task or part of the task, when the training graduate is first required to perform the task on the job? Does the training which is planned include the requirement that, at its end, the trainee will perform the task without error? For example, in the job of a helicopter pilot, one expects tasks such as taking off and landing to be brought to mastery (no-error) level by the time the period of training is completed. In contrast, an error in the performance of a clerk or warehouseman, while undesirable, has a low probability of being serious in the sense of directly endangering personnel. Furthermore, errors in many such tasks can be corrected by supervisors and are expected to decrease in frequency as job experience is gained.

In following the procedures of the ISD model, the training designer will have rated the probable consequences of inadequate performance of job tasks on a nine-point scale (ISD Block I.2.2.1.1.3). For any task rated higher than 5.0, "fairly serious," a "yes" answer at this decision point would seem appropriate. If the consequences of inadequate performance played a large role in selecting the task for training (ISD Block I.2.2.6), that is another indication in favor of the use of a simulator or large or portable equipment. On the other hand, if the job performance measure (JPM) for the task does not require large or portable equipment or a simulator (ISD Block I.2), that is a good indication they are not needed for training either.

When error in a task or tasks is considered to have serious consequences, it is reasonable to conclude that trainees will require "direct practice"

on these tasks. Thus a "yes" answer at this decision point leads to the selection of either large or portable equipment or a highly realistic simulator.

If large or portable equipment and/or a simulator are selected at this point, the designer should still proceed through the rest of the flowchart in order to consider additional media which may aid in other phases of training.

Central Broadcast?

(Decision 2)

The instructional settings listed in ISD Block I.5, Select Instructional Setting, generally preclude the use of central broadcasting. Thus, the choice of a broadcast system would most likely be a special administrative decision and is likely to be made only if all of the following conditions are met:

(a) students are dispersed over a wide geographic area,

(b) the situation requires transmission of the instructional message from a central point, to be received by trainees at scheduled times, and

(c) the message is transitory, that is, it does not require a preserved record after transmission.

If these conditions prevail, either broadcast TV or radio should be selected.

Is it an Attitude; or Verbal Information?

(Decisions 3, 9, 13, 20, 24)

Is the training designed to influence the trainee's values or opinions; or is it designed to impart verbal information for recall? This double-barreled question is designed to divide the entire domain of learning outcomes into two major parts, the other part being skills, mental or motor. The meaning of attitude, a learned disposition that reflects the individual's value choices, is fairly easy to comprehend. The second possibility is that the aim of training is to communicate some verbal information which can be recalled and "told about." For example, verbal information may be learned which enables the trainee to tell about the composition of a general court martial. Such recall does not qualify as a mental skill, and should not be confused with this category of outcome. Thus, a "yes" decision at this point means that what is to be learned is either an attitude or some items of verbal information. A "yes" answer to this question leads to a further decision which will separate the two.

A "no" answer to the question leads to the choice of skill as mental or motor. A mental skill enables the individual to apply a principle or rule to a particular instance. A mental skill is involved, for example, when a compass direction is calculated between two points on a map. A motor skill is required in rewinding a spool of cable, or in driving a vehicle.

Although they are to be distinguished in a later decision, mental and motor skills are related in their requirement for precise feedback during learning. If broadcast media are used, then the auditory or visual

displays provided by the broadcast medium must be supplemented by a means for providing corrective feedback to student responses. Thus, supplementary response booklets would normally be specified for the recording of student responses. As for the feedback itself, an instructor comes to mind. However, if broadcast programs and the supplementary booklets are carefully designed, the limited function of providing corrective feedback may be performed by an assistant instructor.

Are Visual Distinctions Necessary?

(Decision 4)

Can displayed pictures or diagrams aid in the distinguishing of task features? The task being learned may require the distinguishing of its visual features. A control panel requires this, as does the internal appearance of electronic equipment. Reconnaissance of new terrain also requires the distinguishing of visual features. If visual features must be distinguished, the question should be answered "yes". The answer should be readily discernable from the learning activities developed in ISD Block III.1. If the question is answered "yes," television broadcast (rather than radio) is selected. In accordance with the previous decision, the medium requires an assistant instructor to provide corrective feedback.

Attitude?

(Decisions 5, 11, 17, 22, 26)

Does training aim to influence the trainee's values or opinions? An attitude is involved if training aims to influence the students' behavior in an area where he has some freedom to choose his own actions. Attitude instruction is often associated with skills and verbal information, but should be separately considered in media selection. ISD Block II.1 will indicate whether a TLO involves attitudes. ISD Block III.1 will indicate whether an LO involves attitudes.

If an attitude is the goal, probably the most effective media are those that are able to display "human models," respected persons who can indicate their satisfaction with the attitudinal choice. So far as is known, this kind of display is the most effective for establishing or changing attitudes. Those media, such as slide/tape, that can only present static images may be less effective. Audio presentations are also somewhat less effective in establishing attitudes, but the use of techniques such as dramatic radio shows (involving fictional human models) cannot be entirely dismissed as lacking effectiveness.

If the answer to the attitude question is "no", this means that the objective involves verbal information (something that is to be stated). An example is the verbal information an aircraft mechanic might have about the different models of a particular aircraft, or the knowledge an officer might have concerning the different battles fought during the Civil War. The important feature of verbal information is that it is tested by oral or written recall and involves only the statement of facts or pieces of connected prose, never the application of those facts.

Will Visuals Help Recall?

(Decisions 6, 12 18, 23, 27)

Is it likely that the use of visuals will help the learner establish mental images that will aid the recall of verbal information? For example, as an item of information, an aircraft mechanic might be able to describe the pattern of airflow around aircraft wings. If it appears that retention of this knowledge can be enhanced by visual processing (using visual images), then the question should be answered "yes." Whether visuals should be included may be ascertained by examining the learning activities from ISD Block III.1.

Estimating the amount of advantage for visuals in teaching verbal information is not possible at the present time. The advantage exists, but must be weighed against other considerations. Factors favoring a choice of visual presentation are suggested by the following questions:

(a) Is the information lengthy or complex?

(b) Must the information be retained competely and accurately?

(c) Must the information be retained over long periods of time?

If any of these conditions exist, the training developer will be aiming to select a learning strategy that provides effective cues for the retrieval of information that is learned. A visual medium selected by a "yes" answer at this point contributes to that aim.

Self-Instruction?

(Decision 7)

Are trainees expected to learn by self-instruction, without an instructor? An instructor may, of course, manage a self-instructional operation for a group of trainees whom he does not actually teach.

In following the procedures of the ISD system, the decision as to whether to use self-instruction may have been made earlier in the development process. If self-teaching exportable packages (STEPs) were chosen for the instructional setting in Block I.5, self-instruction is indicated. Also, if job performance aids (JPAs) were chosen as the setting, it would be rare for the JPA to be presented in other than a self-paced format. On the other hand, if either Resident School (RS), Installation Support School (ISS), or Formal On-the-Job Training (FOJT) was selected, the choice of group-paced or self-paced instruction will still be open, unless a previous administrative decision has settled this issue.

Self-pacing is the preferred mode in ISD because it allows each learner the maximum opportunity to master the subject matter. It is especially important to choose self-pacing when there is a need for each individual to master a task during training, i.e., when the consequences of inadequate performance are high (see Decision 1).

Platform instruction, rather than self-instruction, is the logical choice when any one of the following ISD factors is present:

(a) social interaction, the exchange of viewpoints, or other such group processes are desired instructional outcomes;

(b) performance conditions specified in LOs or TLOs require a group or team performance;

(c) unstable course content will require frequent changes;

(d) the course is known to have a short life.

Further discussion of the self-instruction versus classroom instruction decision are found in the ISD Phase III Manual, pages 124-126, from which much of the above information has been drawn.

Readers?

(Decisions 8, 19)

Are the trainees capable of gaining information from printed Army training materials? Varying degrees of reading ability may be expected among trainees. This decision pertains to whether trainees are capable of following the meaning of a printed paragraph of Army instructional materials or field manuals, within a few minutes. This decision may have been pre-determined in following ISD procedures, Block II.3, Describe Entry Behavior. Standardized test data that could indicate reading ability may also be available in personnel files.

Motor Practice Necessary?

(Decisions 10, 14, 21, 25)

Skills that involve the learning of smoothly timed muscular responses are called "motor" ("psychomotor") skills. The ISD term is "physical skills." The decision as to whether TLOs and LOs were classified as motor skills should have been made in ISD blocks II.1 and III.1, respectively.

Motor skills can be learned to suitable degrees of refinement when the student directly practices the movements involved. Practice of this sort requires either the actual portable equipment, such as a rifle or grenade, or a training device which "feels like" the real equipment, as does a parachute-drop trainer. (Note that motor practice is likely to be involved also in the earlier Chart A decision leading to a choice of real equipment or a simulator; but those media are assumed to be much more costly.) A "no" decision here implies that the kind of skill being identified is "mental."

Can the Media in D.1 Provide Adequate Feedback?

(Decision 15)

Will the media in D.1 accept and evaluate the required student responses and provide the type of feedback indicated in the learning activities? If a motor skill is being learned by non-readers, the possibility that this can be accomplished by self-instruction should now be reconsidered, with the choice of instructor-led training a possibility.

For example, a learning activity might require students to solder a wire to a connector on a piece of electronic equipment. Neither portable equipment nor a training device can provide adequate feedback on this task, since feedback requires a visual inspection of the soldered joint. An instructor or an assistant instructor would be necessary, which shifts the choice of media to those in box F.1.

Can the Media in D.2 Provide Adequate Feedback?

(Decision 16)

Will the media in D.2 accept and evaluate the required student responses and provide the type of feedback indicated in the learning activities? If a mental skill is being learned by non-readers, the possibility that this can be accomplished by self-instruction should now be reconsidered, with the choice of instructor-led training a possibility.

For example, a learning activity might require students to write clear directions for finding a field position from a headquarters in a nearby city. Neither of the media in D.2 can evaluate a written response for clarity, thus requiring an instructor or assistant instructor, and shifting the choice of media to those in box F.2.

Final Selection Procedure

After you have used the flowchart to identify the appropriate media for each objective in the lesson or course, and have filled in the Media Selection Worksheet, you should make your final selection of media. The final selection may be based on practical considerations, many of which will be found listed in the documentation from ISD Block I.3. Note, however, that the constraints listed there are intended for the construction of job performance measures (JPMs).

Either a single medium or a combination of media may be chosen when making a final selection decision. Make your decision using the procedure listed below.

1. Eliminate media by crossing off (or mentally dismissing) media which are not feasible in the situation for which training is being designed. The following questions are relevant:
   - Can the medium be produced by the time needed?
   - Can the costs of production, maintenance, and operation be afforded?
   - Can the medium be approved as compatible with existing policies and programs?
   - Is the medium practical for use in its intended environment?

2. Make a final choice of media. Consider the following questions:

   - Is more than one medium necessary to enable students to acquire each of the objectives?
   - What are the comparative costs of the final candidate media and media combinations?
   - Can each medium meet your estimated requirements for change and updating?

   Circle your final selection choices on the Media Selection Worksheet.

Media Definitions

A medium may be defined as follows: a category of persons, materials, or events that establishes conditions which enable learners to acquire knowledge, skills, and attitudes (Gerlach & Ely, 1980, p. 241). Most frequently, however, the term "medium" refers to a piece of equipment, or an equipment system, which is customarily used by itself to provide instruction.

A slide projection system is an example of a medium. Obviously, such a system includes as components (a) the projector, (b) the screen, and (c) the slides (containing printed phrases, diagrams, tables) which are projected. This system as a whole is customarily used by itself to provide instruction. For convenience, we will designate each media system by a short descriptive name. The "slide projection system," for example, will be referred to simply as "slides."

Individual Media and Their Definitions

1. Audio. Equipment which delivers a pre-recorded audio message, which may be amplified for groups. The device involved may also have recording capability. Audio systems include audio tape systems, either cassette or reel-to-reel; stylus- or laser-read disc systems; and computer-generated audio.

2. Chart. A flat surface for presenting displays to a class, containing messages in print, handwriting, drawings, pictures, graphs, or other forms. A blackboard is included in the chart category.

3. Computer. The computer displays printed words, symbols, and diagrams, and may accept keyboard, light pen, or touch inputs as student responses. Suitably programmed, it can provide instruction adapted to

the individual student's state of knowledge, display corrective feedback, and perform other adaptive and interactive operations. New varieties of instructional use are foreseen as auditory inputs and outputs become available.

4. Filmstrip. Projection of pictures which are sequentially printed on a strip of film. Such projection may or may not be synchronized with an audio message from a tape player. The function of this equipment is the same as that of slide projection, with and without synchronized audio. It is, however, a separate medium, because it requires different materials and equipment and cannot be readily re-sequenced as slides can.

5. Instructor. As a source of instruction, the most versatile medium is an instructor. Four important functions of an instructor are: (a) delivery of audio messages; (b) directing individual student attention to particular features of a display; (c) human modeling, by serving as a model for choices of personal action; and (d) providing corrective feedback to the individual student. Types of individuals that could fall into this category would be instructors, who can perform any of these functions, and assistant instructors, who typically perform limited functions, such as providing feedback.

6. Interactive TV. This medium combines a microcomputer with videodisc or videotape playback equipment. An interactive TV program, with sound, can become a highly useful "teaching machine" since its branching capabilities can provide feedback tailored to the individual student. It is different from a computer in that it can display motion-visuals and realistic still-visuals.

7. Large Equipment. Operating equipment that is large and non-portable, such as a helicopter, truck, or artillery piece.

8. Motion Picture. A film projection system displaying moving pictures on a screen, often accompanied by a synchronized audio track. Some systems permit large screen projection to large groups. Systems in this medium include 8mm projector systems (either regular or super 8), as well as 16mm and 35mm systems. Included in this category are both sound and silent projection systems although the latter is infrequently used.

9. Overhead Projection. Projection of transparencies (about 8 by 10 inches) displaying print, pictures, or diagrams onto a nearby screen. Overhead projection and the changing of transparencies may be done by the instructor at the front of a classroom or by using rear-screen projection. This category also includes the opaque projector.

10. Portable Equipment. A unitary device (rifle, protective mask), or a component of a real system (dial, carburetor), which is small enough to be readily lifted and transported. Portable equipment is often the medium of choice whenever direct practice of task performances is possible and desirable. Such equipment may sometimes have a specially built-in mechanism to provide corrective feedback to students, and thus may function in the manner of a training device.

11. Printed text. Pages, cards, or other surfaces containing meaningful verbal materials in printed form, for use by individual students. It is always possible for printed text to contain printed pictures or diagrams. Microfiche, microfilm, and other such reduced print media will be included in this category, even though they require additional equipment for their use.

12. Programmed Text. This medium is the basic form of programmed instruction, using printed cards or pages, usually collected into a booklet. A printed text (see item 11) takes on a programmed form when it requires frequent responses and provides feedback.

13. Radio Broadcast. A system for broadcast of audio material from a central station to dispersed locations.

14. Simulator. Typically, equipment used for training or proficiency maintenance which reproduces many of the operating characteristics of the real equipment. An example is an aircraft flight simulator.

15. Slides. A medium without audio which projects still pictures from small slides onto a variety of possible screens, ranging from inches to yards across.

16. Slide/Tape. Projection of still pictures from small slides, accompanied by synchronized audio-tape messages. This category may include a combined slide projector/audio tape system with automatic cueing or separate slide and audio tape machines with synchronization provided through direct human assistance. Slide/tape systems may involve more than one projector. Although the Bessler Cue-See can provide motion visuals, it is included in the slide/tape category because its typical use is closer to slide/tape than it is to motion pictures.

17. Training Aid. A surface layout, model, or mockup, providing a display of parts and processes of a system on which instruction is being given. The simplest form of a training aid is a chart. However, training aids may display parts of real equipment (rather than pictures), and even provide dynamic views of processes (as in a working model of a hydraulic system).

In contrast to a training device (see item 18), a training aid makes no specific provision for corrective feedback to the student.

18. Training Device. Equipment on which mental skills procedures or motor skills can be practiced, and which provides corrective feedback to the student. A training device has its own operating principles and does not attempt to reproduce those of the real equipment, as does a simulator. A training aid (see item 17) is a device for training which does not automatically provide corrective feedback. An example of a training device is a Link trainer.

19. TV Broadcast. A system for broadcast of audio and visual material (TV scenes) from a central station to dispersed locations.

20. TV Cassette. A device which makes possible the display of a pre-recorded program (picture and sound) on a TV receiver. The device may also have a recording capability. Delivery systems covered by this category include reel-to-reel videotape systems, videocassette systems, and videodisc playback systems.

Reference: Gerlach, V.S. & Ely, D.P. Teaching and media: A systematic approach, (2nd ed.) Englewood Cliffs, N.J.: Prentice-Hall, 1980.

Documentation

Three pieces of documentation, outputs of the media selection process, are necessary for further use in later blocks of the ISD model:

(1) the final medium or combination of media chosen for use with the objective(s),

(2) a list of the media in the bottom-line boxes selected, and

(3) the reasons the final choice of media was made from the given alternatives.

MEDIA SELECTION WORKSHEET

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OBJECTIVES

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